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Assimilation of the 1979-2009 microwave satellite data into the regional climate MAR model for studying the Greenland ice sheet melt extent

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The 1979-2009 melt extent derived from the amount of produced meltwater by day simulated by the regional climate model MAR and derived from the spaceborne microwave 19GHz horizontal polarizated (T19H) brightness temperature compares well over the Greenland ice sheet (GrIS). However, some disagreements still occur in some pixels for any days. Therefore, we run the MAR model in an assimilation mode, constrained by the daily SMMR-SSM/I derived melt extent over 1979-2009. As assimilation, we change the MAR near-surface snowpack temperature for the pixels where MAR and satellite disagree. This correction allows to conserve the water equivalent of the snowpack mass in MAR while having a full agreement between model and satellite derived melt extent. The assimilation helps to improve the meltwater production simulation as well as the matching with other satellite data sets (MODIS, GRACE, ...), with the objective to reduce the uncertainties of the current SMB model-based estimates over the GrIS.